Listing of Claims

1. (currently amended) An inter-digital transducer comprising:

a piezoelectric substrate; and

an IDT (inter-digital transducer) electrode having a pair of upper bus bar electrode and lower bus bar electrode placed facing each other on said piezoelectric substrate and a plurality of electrode fingers placed on said piezoelectric substrate each being led out from either said upper bus bar electrode or said lower bus bar electrode toward the other bus bar electrode,

wherein said IDT electrode is constructed of a plurality of divisional IDT electrodes and connected to a balanced type terminal, ~~and~~

wherein said plurality of divisional IDT electrodes includes at least three divisional IDT electrodes, and

wherein the ratio in the number of electrode fingers among said plurality of divisional IDT electrodes is adjusted beforehand so as to have a predetermined impedance value.

2. (currently amended) An inter-digital transducer comprising:

a piezoelectric substrate; and

an IDT (inter-digital transducer) electrode having a pair of upper bus bar electrode and lower bus bar electrode placed facing each other on said piezoelectric substrate and a plurality of electrode fingers placed on said piezoelectric substrate each being led out from either said upper bus bar electrode or said lower bus bar electrode toward the other bus bar electrode,

wherein said IDT electrode is constructed of a plurality of divisional IDT electrodes and connected to a balanced type terminal, ~~and~~

wherein at least two of said plurality of divisional IDT electrodes are equivalently connected in series and at least one of the remaining divisional IDT electrodes is connected in parallel with said at least two divisional IDT electrodes, and

wherein the ratio in the number of electrode fingers among said plurality of divisional IDT electrodes is adjusted beforehand so as to have a predetermined impedance value.

3. (Canceled)

4. (currently amended) The inter-digital transducer according to ~~claim 3~~ claims 1 or 2, wherein said plurality of divisional IDT electrodes is placed in an same/reverse phase relationship so that charges of the divisional IDT electrodes do not cancel out each other.

5. (original) The inter-digital transducer according to claim 4, wherein said plurality of divisional IDT electrodes is constructed of first, second and third divisional IDT electrodes.

6. (original) The inter-digital transducer according to claim 5,

wherein said second divisional IDT electrode is placed in in same phase relationship between said first divisional IDT electrode and said third divisional IDT electrode,

the part of said upper bus bar electrode corresponding to said first divisional IDT electrode and the part of said upper bus bar electrode corresponding to said second divisional IDT electrode are connected to one end of said balanced type terminal, and the part of said lower bus bar electrode corresponding to said second divisional IDT electrode and the part of said lower bus bar electrode corresponding to said third divisional IDT electrode are connected to the other end of said balanced type terminal.

7. (original) The inter-digital transducer according to claim 6, wherein said same phase relationship is a relationship between a pair of said mutually adjacent electrode

fingers and that a pair of said mutually adjacent electrode fingers have an same phase relationship means (1) a connection relationship in which the pitch between said pair of mutually adjacent electrode fingers is $(m+1/2) \times \lambda$ (here, m=0 1, 2, 3, ..., where λ is a wavelength of an excited surface acoustic wave) and of those electrode fingers, one electrode digit is connected to said upper bus bar electrode and the other electrode digit is connected to the lower bus bar electrode, or (2) a connection relationship in which the pitch between said pair of mutually adjacent electrode fingers is $(m+1) \times \lambda$ and both electrode fingers are connected to said upper bus bar electrode, or (3) a connection relationship in which the pitch between said pair of mutually adjacent electrode fingers is $(m+1) \times \lambda$ and both electrode fingers are connected to said lower bus bar electrode.

8. (original) The inter-digital transducer according to claim 7, wherein substantially all adjacent pairs of electrode fingers of said plurality of electrode fingers have an same phase relationship and

said substantially all of the plurality of electrode fingers is connected so that charges of the electrode fingers do not cancel out each other.

9. (original) The inter-digital transducer according to claim 6, wherein both the part of said lower bus bar electrode corresponding to said first divisional IDT electrode and the part of said upper bus bar electrode corresponding to said third divisional IDT electrode are grounded.

10. (original) The inter-digital transducer according to claim 6, wherein the part of said lower bus bar electrode corresponding to said first divisional IDT electrode is connected to the part of said upper bus bar electrode corresponding to said third divisional IDT electrode.

11. (original) The inter-digital transducer according to claim 5, wherein said second divisional IDT electrode is placed between said first divisional IDT electrode and said third divisional IDT electrode, the part of said lower bus bar electrode corresponding to said first divisional IDT electrode is connected to the part of said upper bus bar electrode corresponding to said second divisional IDT electrode, and the part of said lower bus bar electrode corresponding to said second divisional IDT electrode is connected to the part of said lower bus bar electrode corresponding to said third divisional IDT electrode.

12. (original) The inter-digital transducer according to claim 11, wherein adjacent electrode fingers of said first divisional IDT electrode and said second divisional IDT electrode have an reverse phase relationship, adjacent electrode fingers of said second divisional IDT electrode and said third divisional IDT electrode have an same phase relationship and said substantially all of the plurality of electrode fingers is connected so that respective charges do not cancel out each other.

13. (original) The inter-digital transducer according to claim 12,

wherein that said pair of electrode fingers have an same phase relationship refers to a relationship when said pair of electrode fingers are mutually adjacent and (1) a connection relationship in which the pitch between said pair of mutually adjacent electrode fingers is $(m+1/2) \times \lambda$ (here, m=0, 1, 2, 3, ..., where λ is a wavelength of an excited surface acoustic wave) and of those electrode fingers, one electrode digit is connected to said upper bus bar electrode and the other electrode digit is connected to the lower bus bar electrode, or (2) a connection relationship in which the pitch between said pair of mutually adjacent electrode fingers is $(m+1) \times \lambda$ and both electrode fingers are connected to said upper bus bar electrode, or (3) a connection

relationship in which the pitch between said pair of mutually adjacent electrode fingers is (m+1) × λ and both electrode fingers are connected to said lower bus bar electrode, and

that said pair of electrode fingers have an reverse phase relationship refers to a relationship when said pair of electrode fingers are mutually adjacent and (4) a connection relationship in which the pitch between said pair of mutually adjacent electrode fingers is (m+1/2) × λ (here, m=0, 1, 2, 3, ..., where λ is a wavelength of an excited surface acoustic wave) and both electrode fingers are connected to said upper bus bar electrode, or (5) a connection relationship in which the pitch between said pair of mutually adjacent electrode fingers is (m+1/2) × λ and both electrode fingers are connected to said lower bus bar electrode, or (6) a connection relationship in which the pitch between said pair of mutually adjacent electrode fingers is (m+1) × λ and of those electrode fingers, one electrode digit is connected to said upper bus bar electrode and the other electrode digit is connected to the lower bus bar electrode.

14. (original) The inter-digital transducer according to claim 11, wherein both the upper bus bar electrode of said first divisional IDT electrode and the lower bus bar electrode of said third divisional IDT electrode are grounded.

15. (original) The inter-digital transducer according to claim 11, wherein the upper bus bar electrode of said first divisional IDT electrode is connected to the lower bus bar electrode of said third divisional IDT electrode.

16. (currently amended) The inter-digital transducer according to ~~claim 4~~ claims 1 or 2, wherein said plurality of divisional IDT electrodes is constructed of first, second, third and fourth divisional IDT electrodes.

17. (original) The inter-digital transducer according to claim 16,

wherein said plurality of divisional IDT electrodes is placed in order of said first, second, third and fourth divisional IDT electrodes,

the part of said upper bus bar electrode corresponding to said first divisional IDT electrode, the part of said upper bus bar electrode corresponding to said third divisional IDT electrode and the part of said upper bus bar electrode corresponding to said fourth divisional IDT electrode are connected, and

the part of said lower bus bar electrode corresponding to said first divisional IDT electrode, the part of said lower bus bar electrode corresponding to said second divisional IDT electrode and the part of said lower bus bar electrode corresponding to said fourth divisional IDT electrode are connected.

18. (original) The inter-digital transducer according to claim 17,

wherein said same phase relationship refers to a relationship between a pair of said mutually adjacent electrode fingers and that said pair of mutually adjacent electrode fingers are in an same phase relationship means (1) a connection relationship in which the pitch between said pair of mutually adjacent electrode fingers is $(m+1/2) \times \lambda$ (here, m=0, 1, 2, 3, ..., where λ is a wavelength of an excited surface acoustic wave) and of those electrode fingers, one electrode digit is connected to said upper bus bar electrode and the other electrode digit is connected to the lower bus bar electrode, or (2) a connection relationship in which the pitch between said pair of mutually adjacent electrode fingers is $(m+1) \times \lambda$ and both electrode fingers are connected to said upper bus bar electrode, or (3) a connection relationship in which the pitch between said pair of mutually adjacent electrode fingers is $(m+1) \times \lambda$ and both electrode fingers are connected to said lower bus bar electrode.

19. (original) The inter-digital transducer according to claim 18,

wherein of said plurality of electrode fingers, substantially all adjacent pairs of electrode fingers are in an same phase relationship and substantially all of the plurality of electrode fingers is connected so that respective charges do not cancel out each other.

20. (original) The inter-digital transducer according to claim 17,

wherein the part of said upper bus bar electrode corresponding to said second IDT electrode is grounded and the part of said lower bus bar electrode corresponding to said third IDT electrode is grounded.

21. (original) The inter-digital transducer according to claim 17,

wherein the part of said upper bus bar electrode corresponding to said second IDT electrode is connected to the part of said lower bus bar electrode corresponding to said third IDT electrode.

22. (previously presented) The inter-digital transducer according to claim 21,

wherein of adjacent electrode fingers of said second divisional IDT electrode and said third divisional IDT electrode, said second divisional IDT electrode digit is connected to both the part of said upper electrode corresponding to said second divisional IDT electrode and the part of said lower electrode corresponding to said third divisional IDT electrode, and

of adjacent electrode fingers said third divisional IDT electrode digit is connected to both the part of said lower electrode corresponding to said third divisional IDT electrode and the part of said upper electrode corresponding to said second divisional IDT electrode.

23. (previously presented) A surface acoustic wave filter comprising:

a piezoelectric substrate;

a plurality of IDT (inter-digital transducer) electrodes having a pair of upper bus bar electrode and lower bus bar electrode facing each other placed on said piezoelectric substrate and

a plurality of electrode fingers each being led out from either said upper bus bar electrode or said lower bus bar electrode toward the other bus bar electrode; and

a plurality of reflector electrodes,

said surface acoustic wave filter being a longitudinally coupled mode type surface acoustic wave filter in which said plurality of IDT electrodes and said plurality of reflector electrodes are placed in the propagation directions of surface acoustic waves respectively,

wherein at least one of said plurality of IDT electrodes is the IDT electrode of the inter-digital transducer according to claims 1 or 2 and said piezoelectric substrate is the piezoelectric substrate of said inter-digital transducer.

24. (original) A surface acoustic wave filter comprising:

a piezoelectric substrate;

three IDT (inter-digital transducer) electrodes having a pair of upper bus bar electrode and lower bus bar electrode facing each other placed on said piezoelectric substrate and a plurality of electrode fingers each being led out from either said upper bus bar electrode or said lower bus bar electrode toward the other bus bar electrode; and

at least two reflector electrodes,

said surface acoustic wave filter being a longitudinally coupled mode type surface acoustic wave filter in which said three IDT electrodes and said at least two reflector electrodes are placed in the propagation directions of surface acoustic waves,

wherein at least one of said three IDT electrodes is the IDT electrode of the inter-digital transducer according to claim 5,

the part of said upper bus bar electrode of said IDT electrode of said inter-digital transducer corresponding to said first divisional IDT electrode and/or the part of said upper bus

bar electrode of said IDT electrode corresponding to said second divisional IDT electrode are connected to one end of said balanced type terminal of said inter-digital transducer,

the part of said lower bus bar electrode of said IDT electrode of said inter-digital transducer corresponding to said second divisional IDT electrode and/or the part of said lower bus bar electrode of said IDT electrode corresponding to said third divisional IDT electrode are connected to the other end of said balanced type terminal of said inter-digital transducer, and

said piezoelectric substrate is the piezoelectric substrate of said inter-digital transducer.

25. (original) The surface acoustic wave filter according to claim 24,

wherein said three IDT electrodes are first, second and third IDT electrodes,

said second IDT electrode and said third IDT electrode are placed on both sides of said first IDT electrode respectively,

said reflector electrodes are placed opposite said first IDT electrode of said second IDT electrode and opposite said first IDT electrode of said third IDT electrode respectively, and

said first IDT electrode is the IDT electrode of said inter-digital transducer.

26. (original) The surface acoustic wave filter according to claim 25, wherein the upper bus bar electrode of said second IDT electrode is connected to an unbalanced type terminal and the lower bus bar electrode is grounded and the lower bus bar electrode of said third IDT electrode is connected to said unbalanced type terminal and the upper bus bar electrode is grounded.

27. (original) The surface acoustic wave filter according to claim 24, wherein a surface acoustic wave resonator is connected in series to and/or in parallel with at least two of said IDT electrodes.

28. (original) A surface acoustic wave filter comprising:

a piezoelectric substrate;

a plurality of longitudinally coupled mode type surface acoustic wave filters having a plurality of IDT electrodes and a plurality of reflector electrodes placed on said piezoelectric substrate,

wherein said plurality of surface acoustic wave filters are connected in multiple stages,

of said plurality of surface acoustic wave filters, at least the surface acoustic wave filters on the input side and/or the surface acoustic wave filters on the output side are the surface acoustic wave filters according to claim 24, and

said piezoelectric substrates of at least the surface acoustic wave filters on the input side and/or the surface acoustic wave filters on the output side of said plurality of surface acoustic wave filters are the piezoelectric substrates of the surface acoustic wave filters according to claim 24.

29. (previously presented) The surface acoustic wave filter according to claim 28,

wherein said plurality of acoustic wave filters are a first surface acoustic wave filter and a second surface acoustic wave filter,

said first and second surface acoustic wave filters each comprise at least three IDT electrodes,

said first and second surface acoustic wave filters are connected in cascade form,

said first and second surface acoustic wave filters are connected at two points using at least two IDT electrodes, and

the phase of one signal of said IDT electrode is opposite the phase of the other signal of said IDT electrode.

30. (original) A surface acoustic wave filter comprising:

a piezoelectric substrate;

three IDT (inter-digital transducer) electrodes having a pair of upper bus bar electrode and lower bus bar electrode facing each other placed on said piezoelectric substrate and a plurality of electrode fingers each being led out from either said upper bus bar electrode or said lower bus bar electrode toward the other bus bar electrode; and

at least two reflector electrodes,

said surface acoustic wave filter being a longitudinally coupled mode type surface acoustic wave filter in which said three IDT electrodes and said at least two reflector electrodes are placed in the propagation directions of surface acoustic waves respectively,

wherein at least one of said three IDT electrodes is the IDT electrode of the inter-digital transducer according to claim 16,

the part of said upper bus bar electrode of said IDT electrode of said inter-digital transducer corresponding to said first divisional IDT electrode and/or the part of said upper bus bar electrode of said IDT electrode corresponding to said third divisional IDT electrode and/or the part of said upper bus bar electrode of said IDT electrode corresponding to said fourth divisional IDT electrode are connected to one end of said balanced type terminal of said inter-digital transducer,

the part of said lower bus bar electrode of said IDT electrode of said inter-digital transducer corresponding to said first divisional IDT electrode and/or the part of said lower bus bar electrode of said IDT electrode corresponding to said second divisional IDT electrode and the part of said lower bus bar electrode of said IDT electrode corresponding to said fourth divisional IDT electrode are connected to the other end of said balanced type terminal, and

said piezoelectric substrate is the piezoelectric substrate of said inter-digital transducer.

31. (original) The surface acoustic wave filter according to claim 30, wherein said three IDT electrodes are first, second and third IDT electrodes,

said second IDT electrode and said third IDT electrode are placed on both sides of said first IDT electrode respectively,

said reflector electrodes are placed opposite said first IDT electrode of said second IDT electrode and opposite said first IDT electrode of said third IDT electrode respectively, and

said first IDT electrode is the IDT electrode of said inter-digital transducer.

32. (original) The surface acoustic wave filter according to claim 31, wherein the upper bus bar electrode of said second IDT electrode is connected to an unbalanced type terminal and the lower bus bar electrode is grounded and the lower bus bar electrode of said third IDT electrode is connected to said unbalanced type terminal and the upper bus bar electrode is grounded.

33. (original) The surface acoustic wave filter according to claim 30, wherein a surface acoustic wave resonator is connected in series to and/or in parallel with at least two of said IDT electrodes.

34. (original) A surface acoustic wave filter comprising:

a piezoelectric substrate;

a plurality of longitudinally coupled mode type surface acoustic wave filters having a plurality of IDT electrodes and a plurality of reflector electrodes placed on said piezoelectric substrate,

wherein said plurality of surface acoustic wave filters are connected in multiple stages,

of said plurality of surface acoustic wave filters, at least the surface acoustic wave filters on the input side and/or the surface acoustic wave filters on the output side are the surface acoustic wave filters according to claim 30, and

said piezoelectric substrates of at least the surface acoustic wave filters on the input side and/or the surface acoustic wave filters on the output side of said plurality of surface acoustic wave filters are the piezoelectric substrates of the surface acoustic wave filters according to claim 30.

35. (previously presented) The surface acoustic wave filter according to claim 34,

wherein said plurality of acoustic wave filters are a first surface acoustic wave filter and a second surface acoustic wave filter,

said first and second surface acoustic wave filters each comprise at least three IDT electrodes,

said first and second surface acoustic wave filters are connected in cascade form,

said first and second surface acoustic wave filters are connected at two points using at least two IDT electrodes, and

the phase of one signal of said IDT electrode is opposite the phase of the other signal of said IDT electrode.

36. (original) A surface acoustic wave filter comprising:

a piezoelectric substrate;

two IDT (inter-digital transducer) electrodes having a pair of upper bus bar electrode and lower bus bar electrode facing each other placed on said piezoelectric substrate and a plurality of electrode fingers each being led out from either said upper bus bar electrode or said lower bus bar electrode toward the other bus bar electrode; and

a plurality of reflector electrodes,

said surface acoustic wave filter being a longitudinally coupled mode type surface acoustic wave filter in which said two IDT electrodes and said plurality of reflector electrodes are placed in the propagation directions of surface acoustic waves respectively,

wherein at least one of said two IDT electrodes is the IDT electrode of the inter-digital transducer according to claim 5,

the part of said upper bus bar electrode of said IDT electrode of said inter-digital transducer corresponding to said first divisional IDT electrode and/or the part of said upper bus bar electrode of said IDT electrode corresponding to said second divisional IDT electrode are connected to one end of said balanced type terminal of said inter-digital transducer,

the part of said lower bus bar electrode of said IDT electrode of said inter-digital transducer corresponding to said second divisional IDT electrode and/or the part of said lower bus bar electrode of said IDT electrode corresponding to said third divisional IDT electrode are connected to the other end of said balanced type terminal, and

said piezoelectric substrate is the piezoelectric substrate of said inter-digital transducer.

37. (original) The surface acoustic wave filter according to claim 36,

wherein said two IDT electrodes are a first and second IDT electrodes,

said second IDT electrode is placed on one end of said first IDT electrode,

said reflector electrodes are placed opposite said second IDT electrode of said first IDT electrode and opposite said first IDT electrode of said second IDT electrode respectively, and

said first IDT electrode is the IDT electrode of said inter-digital transducer.

38. (original) A surface acoustic wave filter comprising:

a piezoelectric substrate;

five IDT (inter-digital transducer) electrodes having a pair of upper bus bar electrode and lower bus bar electrode facing each other placed on said piezoelectric substrate and a plurality of electrode fingers each being led out from either said upper bus bar electrode or said lower bus bar electrode toward the other bus bar electrode; and

at least two reflector electrodes,

said surface acoustic wave filter being a longitudinally coupled mode type surface acoustic wave filter in which said five IDT electrodes and said plurality of reflector electrodes are placed in the propagation directions of surface acoustic waves respectively,

wherein at least one of said five IDT electrodes is the IDT electrode of the inter-digital transducer according to claim 5,

the part of said upper bus bar electrode of said IDT electrode of said inter-digital transducer corresponding to said first divisional IDT electrode and/or the part of said upper bus bar electrode of said IDT electrode corresponding to said second divisional IDT electrode are connected to one end of a balanced type terminal,

the part of said lower bus bar electrode of said IDT electrode of said inter-digital transducer corresponding to said second divisional IDT electrode and/or the part of said lower bus bar electrode of said IDT electrode corresponding to said third divisional IDT electrode are connected to the other end of said balanced type terminal, and

said piezoelectric substrate is the piezoelectric substrate of said inter-digital transducer.

39. (previously presented) A communication apparatus comprising:

a transmission circuit that outputs transmission waves; and

a reception circuit that receives reception waves,

wherein the surface acoustic wave filter used for said transmission circuit and/or said reception circuit is the inter-digital transducer according to claims 1 or 2.

40. (original) A communication apparatus comprising:

a transmission circuit that outputs transmission waves; and

a reception circuit that receives reception waves,

wherein the surface acoustic wave filter used for said transmission circuit and/or said reception circuit is the surface acoustic wave filter according to claim 23.